necessarily be followed by a fluoride treatment due to the hydrolysis of the complex fluoride ions.

EXAMPLE 2

Four areas delineated on each of three bovine teeth were treated for five minutes with one-step fluoridating solutions, each saturated with respect to DCPD and having a pH of 2.1. The first solution additionally contained $NaBF_3OH$ in a concentration of 0.1M, the second solution contained 0.48M $NaBF_4$ and the third solution contained 0.24M $CaSiF_6$. A fourth untreated area served as a control. All of the samples were washed with 1.0M KOH before measurement and four biopsies on each sample were taken. The results are tabulated below in Table II.

TABLE II

	Mean Enamel Fluoride Contents (ppm)			
Enamel layer thickness (μm)	DCPD+ $NaBF_3OH$	DCPD+ $NaBF_4$	DCPD+ $CaSiF_6$	Control
$3.29_{(0.74)}$[1]	$1195_{(218)}$	$815_{(213)}$	$2039_{(341)}$	$818_{(665)}$
$3.61_{(0.72)}$	$1085_{(160)}$	$753_{(193)}$	$1996_{(503)}$	$729_{(431)}$
$4.14_{(0.69)}$	$1040_{(243)}$	$716_{(118)}$	$1744_{(691)}$	$726_{(317)}$
$3.88_{(0.83)}$	$1133_{(220)}$	$636_{(178)}$	$1607_{(742)}$	$569_{(154)}$

[1]Quantities in parenthesis indicate standard deviations.

As can be seen from the above results, two of the three inventive one-step solutions containing complex fluoride compounds resulted in significant enamel fluoride uptake at all depths as compared to the control. $CaSiF_6$ was the most effective of the three complex fluoride compounds tested, while $NaBF_4$ showed the least fluoride uptake.

For use in substantially nonaqueous dispersions, MCPM and MCPA are highly advantageous because these two compounds when dissolved in dilute aqueous solvents produce DCPD-forming solutions having pH's below 4.3. This is in contrast to solid DCPD, which does not form a DCPD-forming solution when dissolved in a dilute aqueous solvent. See Pickel et al, "The Effects of a Chewing Gum Containing Dicalcium Phosphate on Salivary Calcium and Phosphate." J. Ala. Med. 2: 286–287 (1965). To form the inventive dispersions, solid fluorapatite and either MCPA or MCPM, or both, also in solid form, are mixed together. Preferably, the solid compounds are dispersed within a substantially nonaqueous medium, such as substantially nonaqueous toothpaste, chewing gum, or mouthrinse. Upon contact with a dilute aqueous solvent, such as water or saliva, an aqueous solution or gel is formed that contains calcium and phosphate in concentrations greater than or equal to approximately fifty percent of the saturation concentrations for DCPD such that the pH of the solution or gel is less than or equal to the singular point pH of DCPD and hydroxyapatite, insuring that DCPD will form in the enamel's surface. Furthermore, the resulting solution or gel is also saturated with respect to fluorapatite such that no fluorapatite is dissolved from the tooth enamel, even if pretreatment is not immediately followed by a conventional fluoridation treatment. The solid components may be dispersed within the various substantially nonaqueous media, such as substantially nonaqueous toothpaste, chewing gum, or mouthrinse, in manners well known in those particular arts. In addition, the substantially nonaqueous dispersion may be bonded to dental floss or tape in manners well known in those particular arts. Alternatively, the solid components could be mixed together without any nonaqueous media to form the inventive dispersion.

DCPD, DCPA and/or CaF_2 may also be added in solid form to the inventive nonaqueous dispersion, in addition to MCPM or MCPA, as long as the resulting solution or gel does not have a pH greater than 4.3 at ambient temperatures. Treatment with the nonaqueous dispersion should be followed with a conventional fluoridation treatment as above described. In addition, the inventive nonaqueous dispersions or dry powder mixtures may contain complex fluoride compounds similar to those described for single-step treatment procedures.

In addition to the essential constituents of the inventive solutions or gels, additional components may be added as necessary to obtained desired calcium and phosphate concentrations, pH's, ionic strengths, or viscosities. These would include acids, bases, salts, or thickening agents, which are all well known in the art of dental materials.

Though the preferred embodiments of the present invention have been described in terms of the fluoridation and mineralization of dental enamel, the inventive methods and compositions are also useful in treating dentin and exposed root surfaces. Under ordinary circumstances neither of these dental tissues is exposed. However, dentin may become exposed if the overlying enamel is abraded and gingival recession may expose the root surfaces. In such cases, treatment with the inventive compositions and methods would reduce the incidence of caries as well as the temperature, pressure, chemical, and mechanical sensitivities of these tissues. It should also be understood that the foregoing disclosure emphasizes certain specific embodiments of the invention and that all modifications or alternatives equivalent thereto fall within the spirit or scope of the invention.

We hereby claim as our invention:

1. A method for topically fluoridating and/or mineralizing dental tissue such that $Ca_5(PO_4)_3$ is incorporated into the tissue, comprising in combination the following steps:

(a) treating the surface of the tissue with a substantially nonaqueous dispersion such that $CaHPO_4.2H_2O$ is formed in the surface of the tissue, the dispersion containing (1) $Ca_5(PO_4)_3F$ and (2) at least one calcium phosphate compound selected from the group consisting of $Ca(H_2PO_4)_2.H_2O$ and $Ca(H_2PO_4)_2$, the treatment step occurring in the presence of a dilute aqueous solvent such that the dispersion and the solvent form an aqueous solution or gel containing calcium and phosphate ions in concentrations greater than or equal to approximately fifty percent of the saturation concentration for $CaHPO_4.2H_2O$ in the solution or gel, the solution or gel being saturated with respect to $Ca_5(PO_4)_3F$, and the solution or gel having a pH less then or equal to approximately 4.3; and

(b) applying a fluoridation agent selected from the group consisting of acidulated phosphate fluoride, SnF_2, NaF and TiF_4 to the surface of the tissue.

2. The method of claim **1** wherein the phosphate compound is $Ca(H_2PO_4)_2.H_2O$.

3. The method of claim **1** wherein the dilute aqueous solvent is saliva.

4. The method of claim **1** wherein the substantially nonaqueous dispersion additionally comprises at least one compound selected from the group consisting of $CaHPO_4.2H_2O$, $CaHPO_4$, and CaF_2.